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Published in:
Geophysical Research Abstracts

Publication date:
2016

Geophysical Research Abstracts
Vol. 18, EGU2016-9979-2, 2016
EGU General Assembly 2016

Nutrient pollution mitigation measures across Europe are resilient under future climate

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The key results from the application of catchment-scale biophysical models to assess the likely effectiveness of nutrient pollution mitigation measures set in the context of projected land management and climate change are presented. The assessment is based on the synthesis of modelled outputs of daily river flow, river and lake nitrogen and phosphorus concentrations, and lake chlorophyll-a, for baseline (1981-2010) and scenario (2031-2060) periods for nine study sites across Europe. Together the nine sites represent a sample of key climate and land management types. The robustness and uncertainty in the daily, seasonal and long-term modelled outputs was assessed prior to the scenario runs. Credible scenarios of land-management changes were provided by social scientists and economists familiar with each study site, whilst likely mitigation measures were derived from local stakeholder consultations and cost-effectiveness assessments. Modelled mitigation options were able to reduce nutrient concentrations, and there was no evidence here that they were less effective under future climate. With less certainty, mitigation options could affect the ecological status of waters at these sites in a positive manner, leading to improvement in Water Framework Directive status at some sites. However, modelled outcomes for sites in southern Europe highlighted that increased evaporation and decreased precipitation will cause much lower flows leading to adverse impacts of river and lake ecology. Uncertainties in the climate models, as represented by three GCM-RCM combinations, did not affect this overall picture much.